

Instrumental-affective touch in OT practice supporting the development of collaborative robots

Raffaele Buono¹, Minna Nygren¹, Liang He², Perla Maiolino², Nadia Bianchi-Berthouze¹

¹ University College London, ² University of Oxford

BACKGROUND

The development of collaborative robots for healthcare has been keenly explored [e.g., 1, 2]. In Occupational Therapy (OT), social robots give support to therapists during handling of patients [e.g., 3], or train both clinicians [e.g., 4] and the patients' families [e.g., 5, 6]. However, touch is a complex phenomenon, and its nature is holistic; it could, for example, scare a person [7] if not considered from a wider embodied perspective. While affective touch is an important modality in interaction between humans [8], healthcare research on touch has primarily foregrounded it as either instrumental [9] or affective [10].

This study builds on research [11] into the role of touch in patient-clinician interaction which demonstrated that touch is simultaneously instrumental and affective. While robots, touch and affect has been studied, from the perspective of pain [12], affect has not been studied more broadly. Research on dimensions such as touch pressure (e.g. soft vs firm touches), touch used in conjunction with speech (i.e. "I'm going to touch you now.") or people's reaction to touch (e.g. becoming scared) remains scarce. This is important given developments in social robots that could support the daily care of patients [e.g., 13].

AIMS AND RESEARCH QUESTIONS

This study aims to (1) understand dimensions of affective-instrumental touch in occupational therapy practice, (2) develop methodological approaches to gaining access to these dimensions, and (3) gain practical ideas for social robotics development from an early design-based research process.

Research questions underpinning this study:

What roles does touch play in OT-patient communication? How do OTs adapt and modulate their touch to accommodate patient's affective states and needs? How could a robot support OTs in providing assistance to patients? How should a patient-simulating robot (or a part of a patient) be designed to support OT training?

METHODS

Semi-structured interviews. Individual semi-structured 1hr interviews were conducted with ten practicing occupational therapists. Therapists were asked to reflect on their use of instrumental touch, and affect.

Workshop. Eleven practicing OTs participated in a workshop developed to (1) re-enact touch modulations during patient-clinician interaction re-enactment, (2) explore affective scenarios therapists encounter, and (3) discuss patients' skin responses that may affect the way in which therapists use touch.

FINDINGS

Roles in touch. Therapists foregrounded the issue of "who should touch" the patient. This was shaped through patients' affective needs and social context (Quotes 1-3).

Quote 1: "The parents are the best medicine, the best therapy, the best nursing. So the parents' touch is always going to be the best from a physiological perspective, from an emotional perspective, maybe not from like an expertise level. [...]
The parents can speak to them, and the parents can read their cues dependent on the baby."

Interview participant (P4)

Quote 2: "When we were rolling him [the patient] would get really anxious. And we got his wife to come in. She would stroke his face or hold his hand when personal care was being done to provide reassurance.

I think from a professional point of view it wouldn't feel appropriate to stroke somebody's face. Or to feel their hair. I think that's a very personal thing to do."

Workshop participant (P8)

Quote 3: "A few months ago I went to see a woman who was stuck in a chair. There were risks of all sorts. Wash the lesions and she was just mortified.

She was so embarrassed being in that position. I think she was so embarrassed, and I think she was sad. In hindsight, it shouldn't have been me. It should've been a female OT."

Workshop participant (P5)

Patients' affective state and physical cues. OTs' understanding of the patients' affective needs was informed by taking a person-centric perspective, reading bodily cues and being attentive to what patients' skin (Quotes 4-6).

Quote 4: "They [patients] do have some level of grief in an area of their life. I think quite often we experienced tears and emotion.
It's about reading the situation, reading their body language and how they're responding to you. What is the relationship with them like, and how far you think that they need you to go as a professional to kind of put them at ease."

Workshop participant (P6)

Quote 5: "The person had MS and weren't able to speak. They didn't have any communication device. I was going to explain what I was going to do... and every time I went near to them, they just backed off and looked really afraid. I just couldn't work it out.

Afterwards I thought, I had a mask on, but maybe it was just fear of proximity. And maybe because of Covid. Sort of physically not wanting to be so close. Because when you go to touch somebody you have to get very close to them."

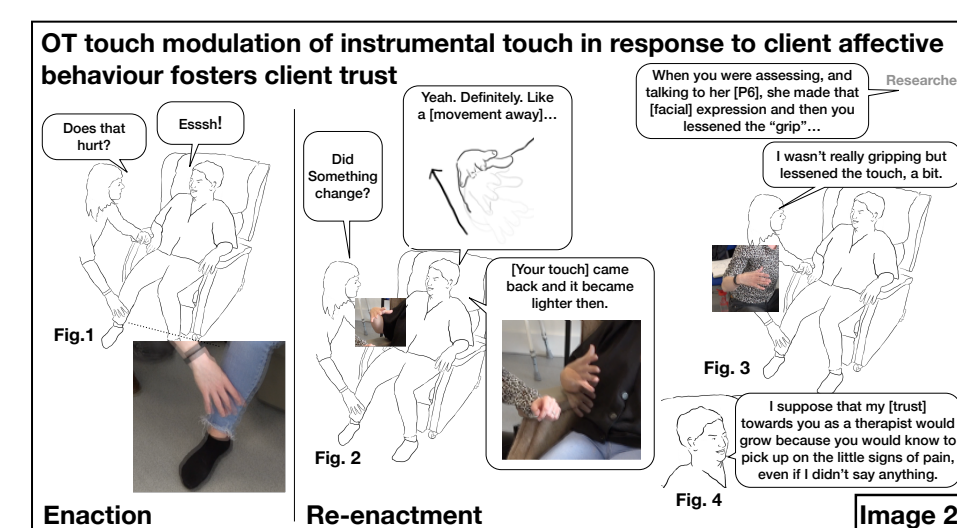
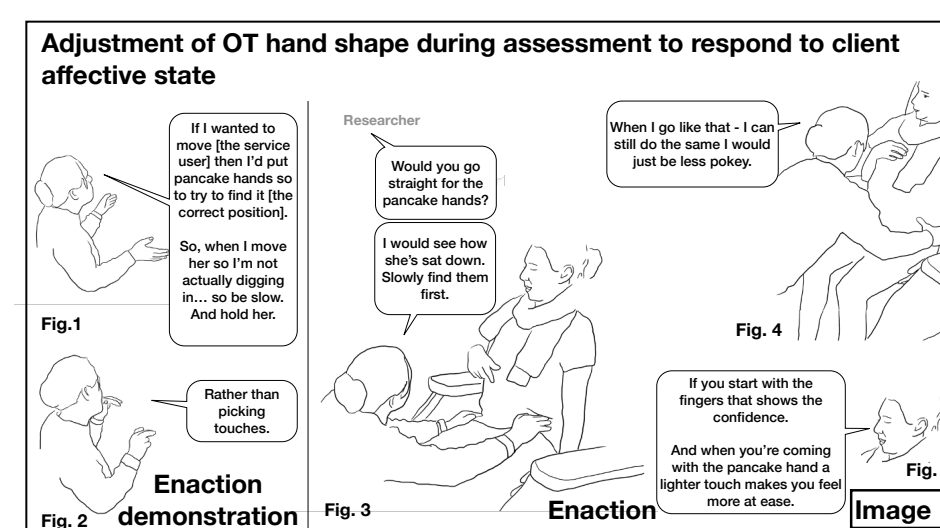
Workshop participant (P10)

Quote 6: "Some of the tasks you'd expect them [patients] to be sweating where you're touching them, especially if it's physically draining. In other instances, it would be a warning sign that maybe this is pushing them a bit too far. Sweat is an indicator.

I tend to go with the skin tone colour where I'm touching. I aim to never make anyone's skin turn white."

Interview participant (P3)

Touch modulations in OT-client re-enactments. In their re-enactments of patient-clinician scenarios, OTs demonstrated touch modulations to accommodate for patients' affective and physical needs (Images 1 and 2).



CONCLUSIONS

Touch is very complex. More research is needed to fully understand the nuances of instrumental-affective touch in different contexts. Our research demonstrates that occupational therapists' use of touch depends on the type of patient, their needs, and the experience of the therapist.

Touch is not only about instrumental or empathic. The two are merged and they are modulated.

We need to understand affective quality of touch. This may improve the efficacy of instrumental touch, or even trust in the OT.

REFERENCES

- [1] Banks J. (2018). The Human Touch: Practical and Ethical Implications of Putting AI and Robotics to Work for Patients. *IEEE Pulse*, 9(3), pp. 15-18.
- [2] Chita-Tegmark, M., Scheutz, M. (2021). Assistive Robots for the Social Management of Health: A Framework for Robot Design and Human-Robot Interaction Research. *International Journal of Social Robotics* 13, pp. 197-217.
- [3] Kato K., Yoshimi T., Aimoto K., Sato K., Itoh N., Kondo I. (2022). Reduction of multiple-caregiver assistance through the long-term use of a transfer support robot in a nursing facility. *Assistive Technology* 23, pp. 1-8.
- [4] Liang, H-W., Wu, K-M., Weng, C-H., Hsieh, H-W. (2019). Nurses' Views on the Potential Use of Robots in the Paediatric Unit. *Journal of Paediatric Nursing* 47, pp. 58-64.
- [5] Yuji I., Imura, T., Suzukawa, T., Fukuyama, H., Ishii, T., Taki, S., Imada, N., Shibukawa, M., Inagawa, T., Araki, H., Araki, O. (2019). Combination of Exoskeletal Upper Limb Robot and Occupational Therapy Improve Activities of Daily Living Function in Acute Stroke Patients. *Journal of Stroke and Cerebrovascular Diseases* 28(7), pp. 2018-2025.
- [6] Beveridge, B., Feltracco, D., Struyf, J., Strauss, E., Dang, S., Phelan, S., Wright, F. V., and Gibson, B. E. (2015) "You gotta try it all": Parents' Experiences with Robotic Gait Training for their Children with Cerebral Palsy. *Physical & Occupational Therapy In Paediatrics* 35(4), pp. 327-341.
- [7] Coco, K., Kangasniemi, M., Rantanen, T. (2018). Care Personnel's Attitudes and Fears Toward Care Robots in Elderly Care: A Comparison of Data from the Care Personnel in Finland and Japan. *Journal of Nursing Scholarship* 50(6), pp. 1527-6546.
- [8] Teysier, M., Bailly, G., Pelachaud, C., and Lecolinet, E. (2015). Conveying Emotions Through Device-Initiated Touch. *IEEE Transactions on Affective Computing* 13(3), pp. 1477-1488.
- [9] De Augustinis, J., Isani, R.S. and Kumler, F.R. (1963). Ward study: The meaning of touch in interpersonal communication. In *Some clinical approaches to psychiatric nursing*. New York: Macmillan, pp. 271-306.
- [10] Huss, A.J. (1977). Touch with care or a caring touch?. *American Journal of Occupational Therapy* 31(1), pp. 11-18.
- [11] Buono, R.A., Nygren, M., Bianchi-Berthouze, N., (under review). Touch, communication and affect: a systematic review on the use of touch in healthcare professions.
- [12] Geva, N., Uzelovsky, F. and Levy-Tzedek, S. (2020). Touching the social robot PARO reduces pain perception and salivary oxytocin levels. *Scientific Reports* 10(9814).
- [13] Mazursky, A., DeVoe, M., and Sebo, A. (2022). Physical Touch from a Robot Caregiver: Examining Factors that Shape Patient Experience. *31st IEEE International Conference on Robot and Human Interactive Communication* Napoli, Italy, 2022, pp. 1578-1585.